Clim. Past Discuss., 7, C354–C356, 2011
www.clim-past-discuss.net/7/C354/2011/

Climate of the Past Discussions

Interactive comment on "High-resolution records of the beryllium-10 solar activity proxy in ice from Law Dome, East Antarctica: measurement, reproducibility and principal trends" *by* J. B. Pedro et al.

Anonymous Referee #3

Received and published: 27 April 2011

Overall comments:

This paper deals with sub-monthly to monthly records of 10Be from Law Dome ices over the last decade. In this paper, the authors describe in details their methodology on the 10Be measurement and discuss reproducibility of 10Be data, a concern for which had been raised in a previous Antarctic study. After that, they demonstrate, using Antarctic neutron monitor (NM) data, that a general trend seen in the 10Be record represents the Schwabe cycle, and reveal that seasonal variations in 10Be are mainly due to the transport of air from stratosphere to troposphere. It is worthwhile that both

the veracity of 10Be solar activity proxy and its reproducibility in selected ice core sites are supported in this paper. Some concerns that, in my opinion, the authors should address before publication of this paper in CP are as follows:

Major comments:

3.1 Concentration and flux

In wet deposition areas such as Law Dome, it is obvious that one should use concentration rather than flux unless there are large climatic transitions. However, in such a case, other meteorological effects possibly affect the 10Be signals as discussed in an earlier paper (Pedro et al., 2006, JGR). They may influence discussions on the trend performed in Section 3.4.1 (especially, on the lag of 10Be and NM and an inconsistence between those after 2008), where some additional discussions based on the relation between 10Be and d18O are necessary.

3.2 Reproducibility

Despite much smaller (insignificant) than that shown in Moraal et al. (2005), the authors found two types of difference between ice core 10Be records obtained from very near sites. Rather negligible one is difference regarding a spike in 2005 summer described in the first paragraph in Section 3.2. The difference of the timing of the spike is within the error of the dating. However, since exceeding the measurement error, the authors conclude that the difference in peak values represents a real difference caused by environmental factors. I never exclude such possibility. However, I think that the authors should add an alternative possibility that the difference was brought about by experiments or coring or both (as discussed in the subsequent paragraphs), or simply insert the word "may" before the word "represent" on line 23 of page 688. There is no reason that only this spike was not affected by such effects.

Another one is somewhat more serious: that is an offset between snow pits (DSS0102- and DSS0506-pits) and a thermally drilled core (DSS0506-core). The offset is clear

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over considerable intervals: snow pit data are higher in concentration than thermally drilled core. As the authors are recognizing, this can be expressed in other words: acidified samples are frequently higher in concentration than non-acidified one. I agree with the authors that the releasing of undesirable 10Be atoms from dusts and micrometeorites has an only negligible effect for Antarctic ices. However, I disagree with their statement that "any loss of 10Be by absorption to laboratory equipments should be balanced by corresponding loss of 9Be carrier". The statement would be right if the chemical forms of the carrier 9Be and ice-core 10Be was practically the same. Since the chemical form of 10Be in ice (and its melt water) is poorly known, an active dissolution process (such as acidification) is necessary for avoiding selective adsorption of 10Be atoms to bottle walls, filters (especially, a submicron filter), and dusts. Such behavior of 10Be in sample solution is described in details in Finkel and Nishiizumi (1997) and Yiou et al (1997) and should be considerd in Sections 3.2 and 3.4.1.

Minor comments:

Page 684, lines 8-9. What is the volume of the column filled with resins?

Page 684, lines 13-14. Which fraction(s) was (were) collected for the subsequent analysis? If the all, why was the eluent divided into three parts?

Page 698, line 20. "a" should be replaced by "and".

2.4 Extraction of 10Be from ice and AMS measurement

I understand that the authors paid special attention to the pretreatment of sample for good boron suppression and the resulting successful AMS measurement. However, it seems to go a bit overboard, because a successful 10Be determination of 2-13 x 10ˆ-13 level has been realized by using ordinary (easier) procedures in many previous works.

Interactive comment on Clim. Past Discuss., 7, 677, 2011.